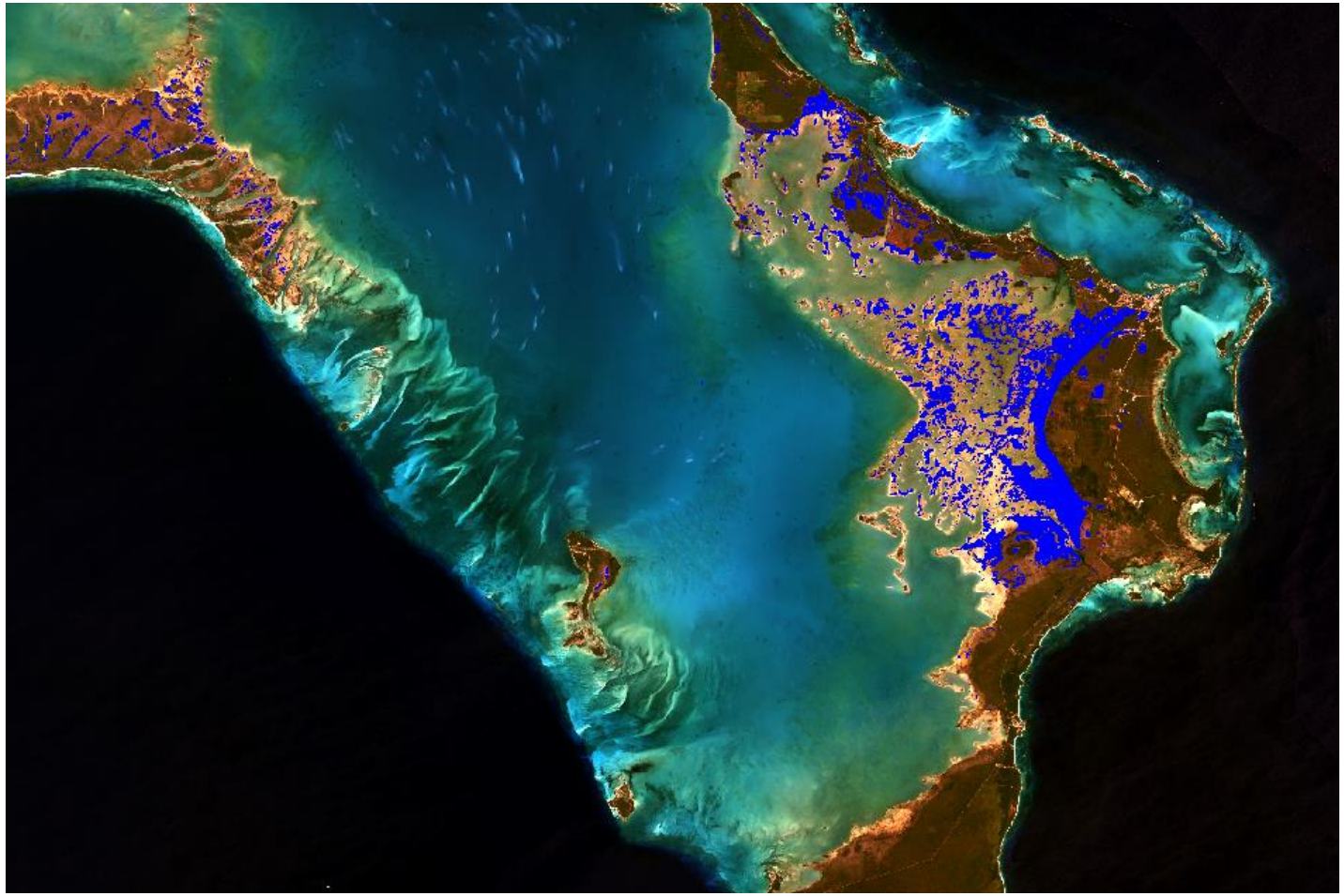
Master SAR

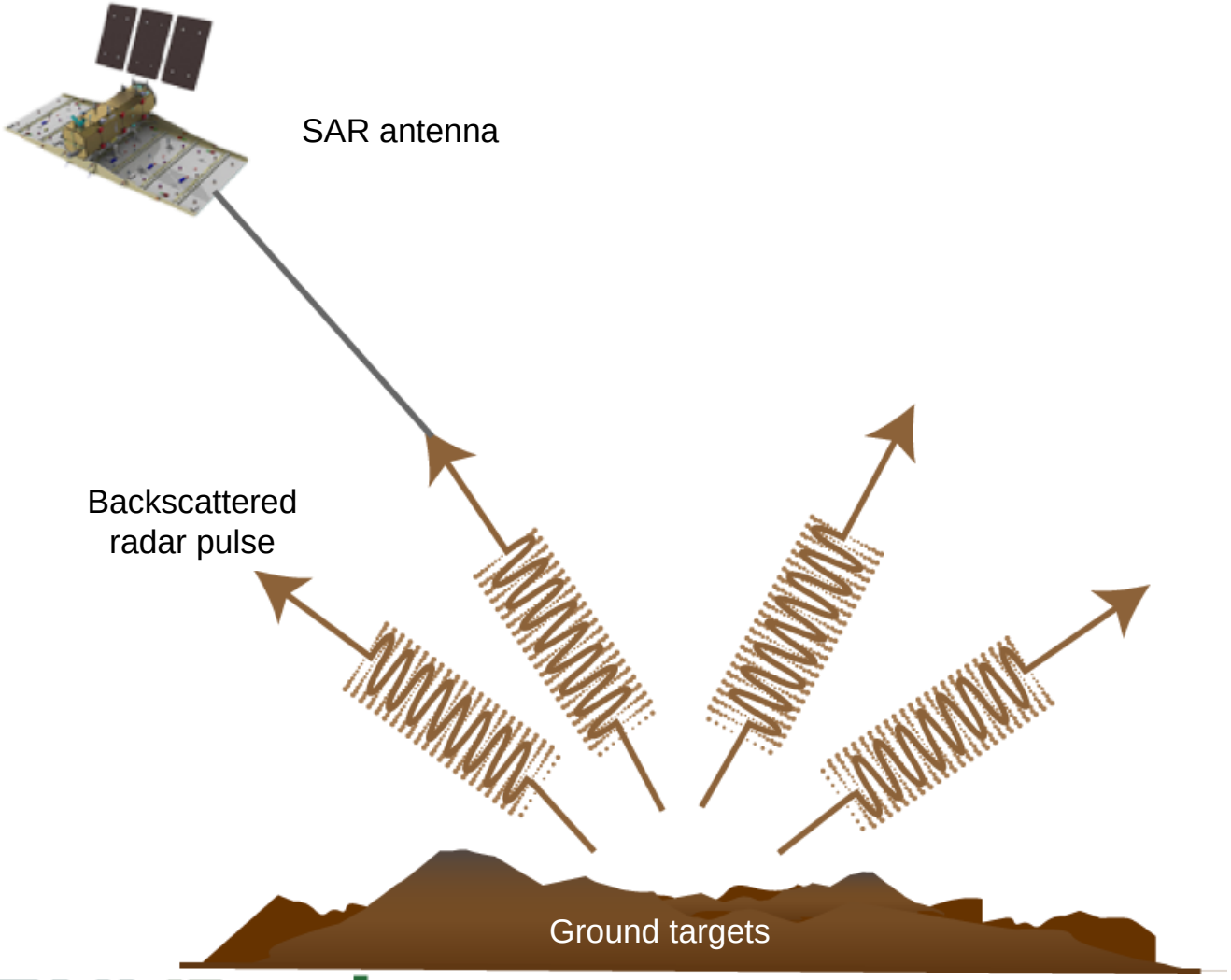


Megan Gallagher

Solutions Engineer, L3Harris Geospatial

Megan.Gallagher@L3Harris.com

What is Synthetic Aperture Radar?



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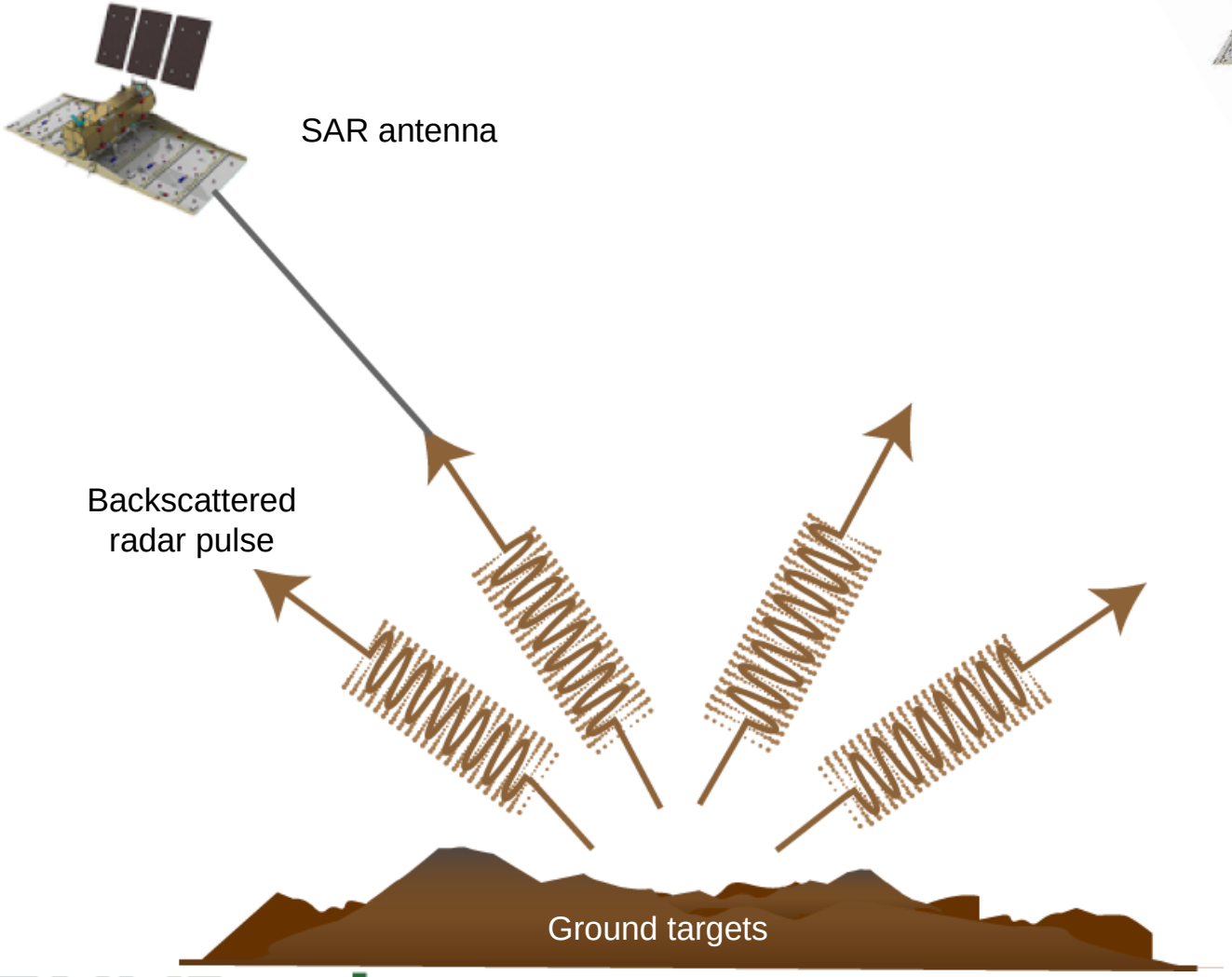
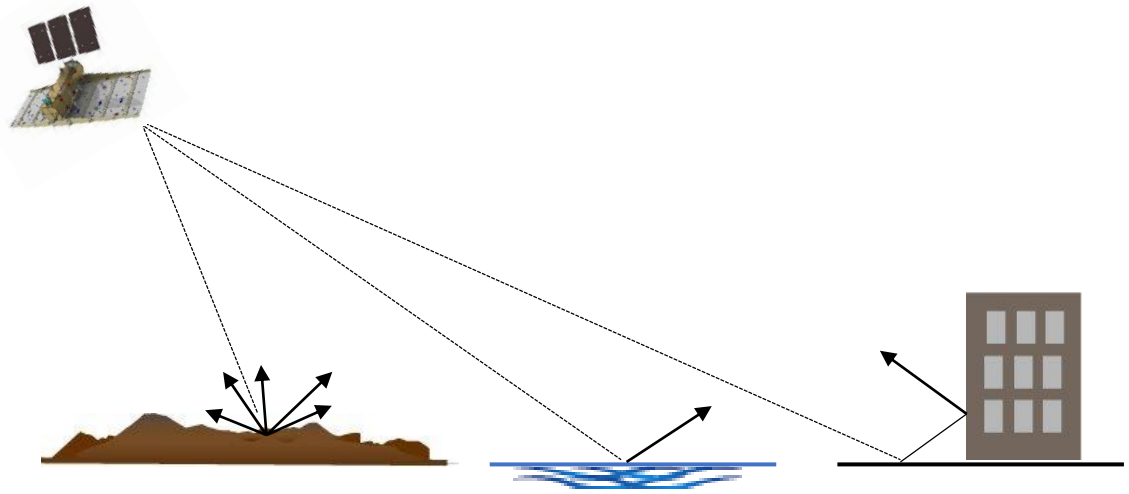
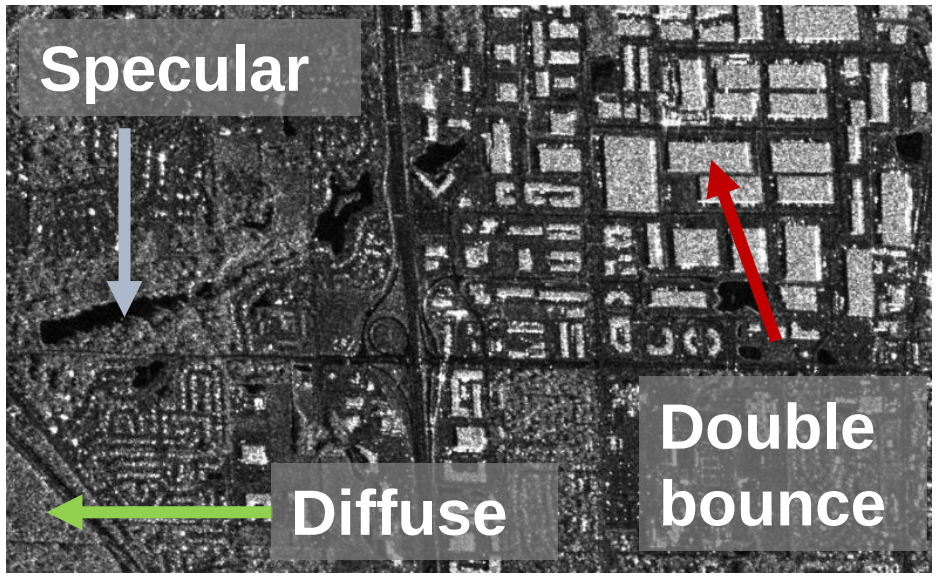
What is Synthetic Aperture Radar?







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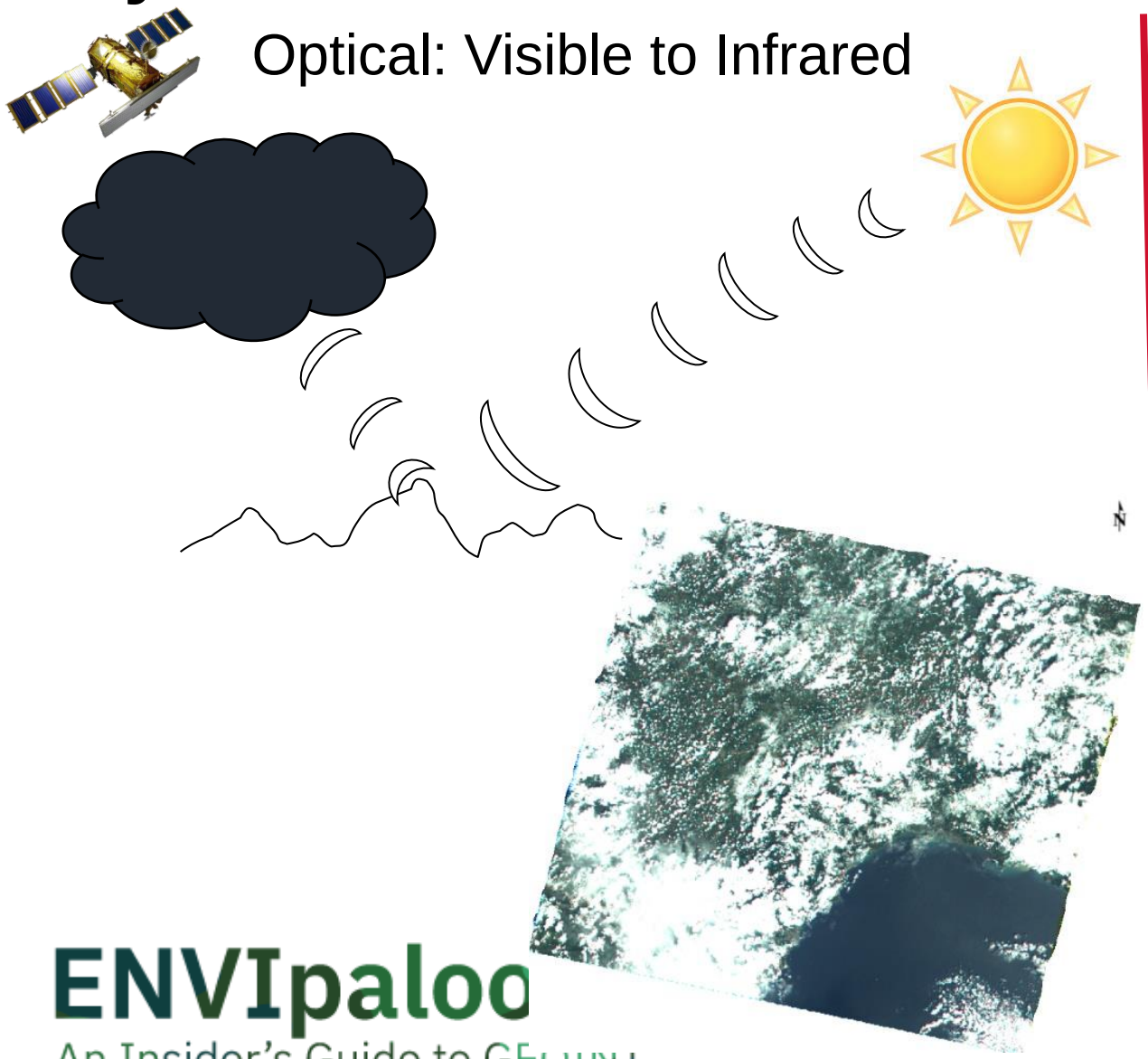
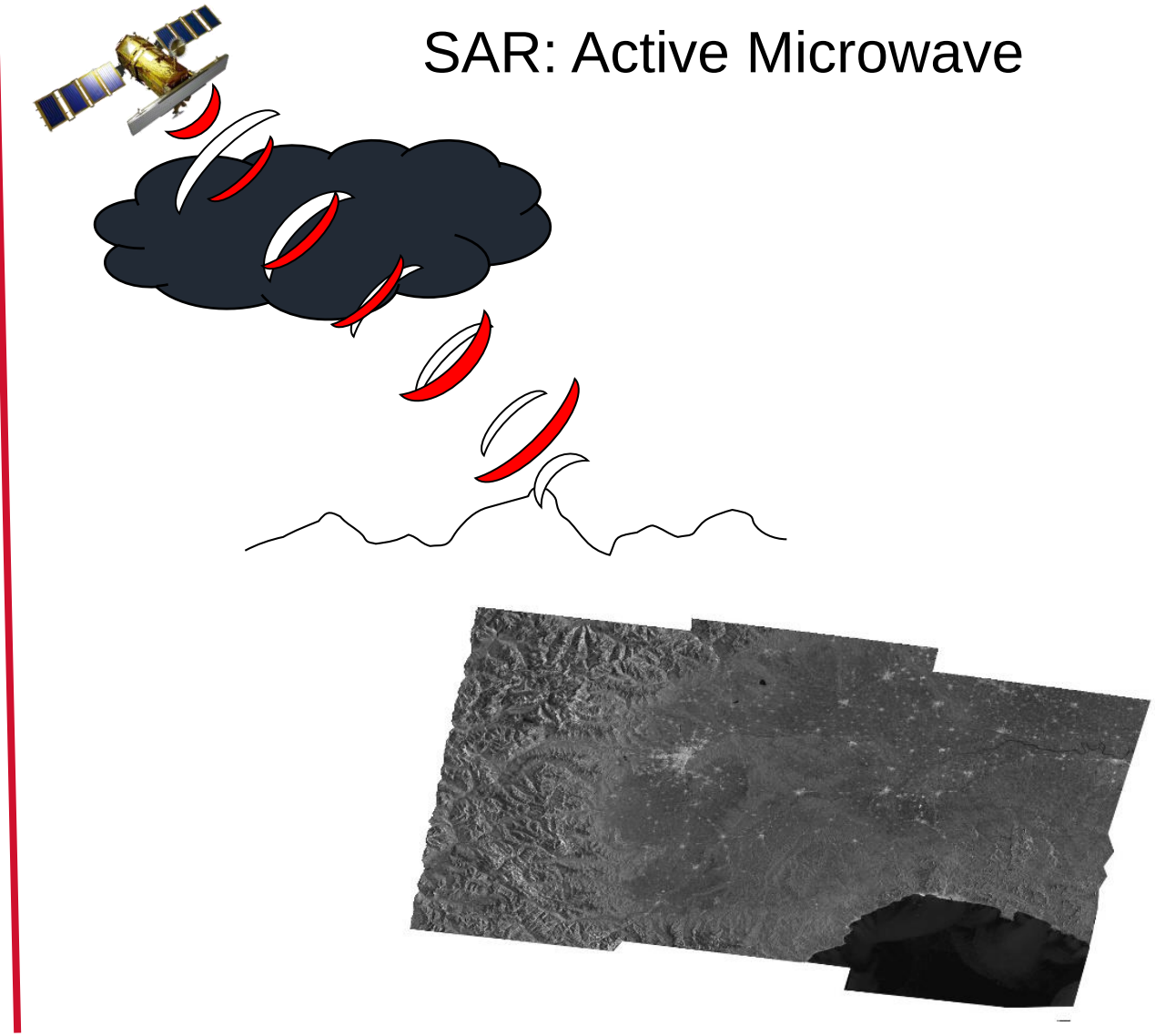
Why SAR?

Optical: Visible to Infrared



SAR: Active Microwave



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Optical vs. SAR

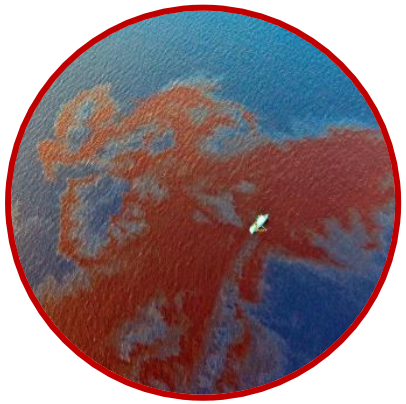
TerraSAR-X -Indianapolis
07/01/ 2007

QuickBird - Indianapolis
07/01/ 2007

Synthetic Aperture Radar Applications

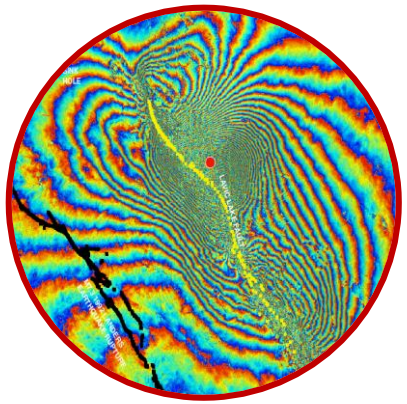
Landslides

Glaciers and permafrost



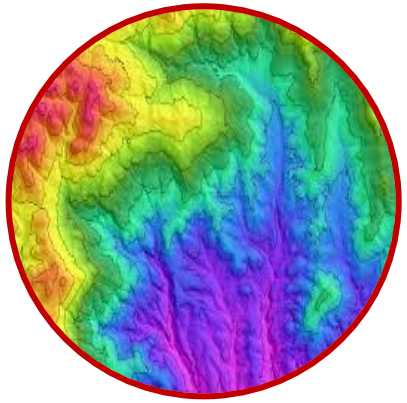
Oil spills

Subsidence



Earthquakes

Shipping



DEM generation

Biomass

Deforestation

Flooding

Volcano monitoring

Activity monitoring

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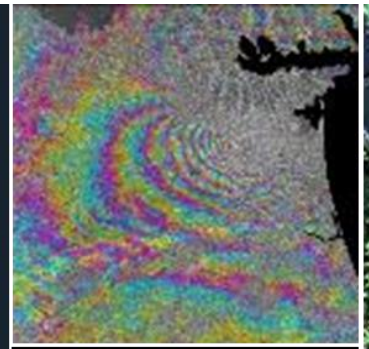
ENVI SARscape

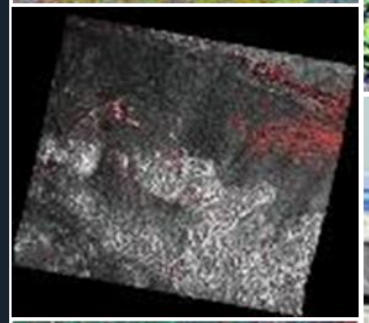
Easily process and analyze SAR data

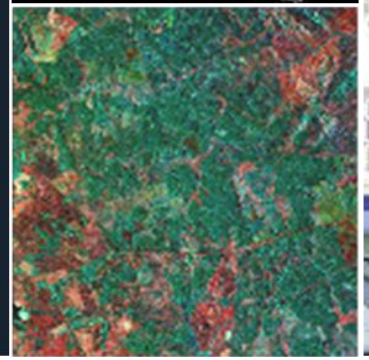
Easily process and analyze SAR data and generate products like DEMs or surface deformation maps

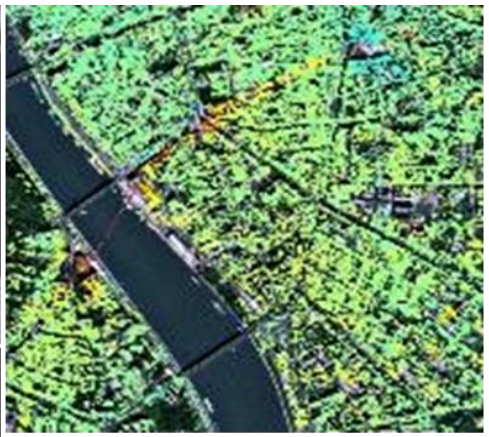
Built-in workflows and modules simplify processing and can be customized

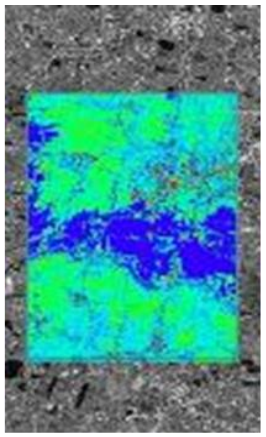
ENVI integration brings advanced image and SAR processing and analysis together in one package

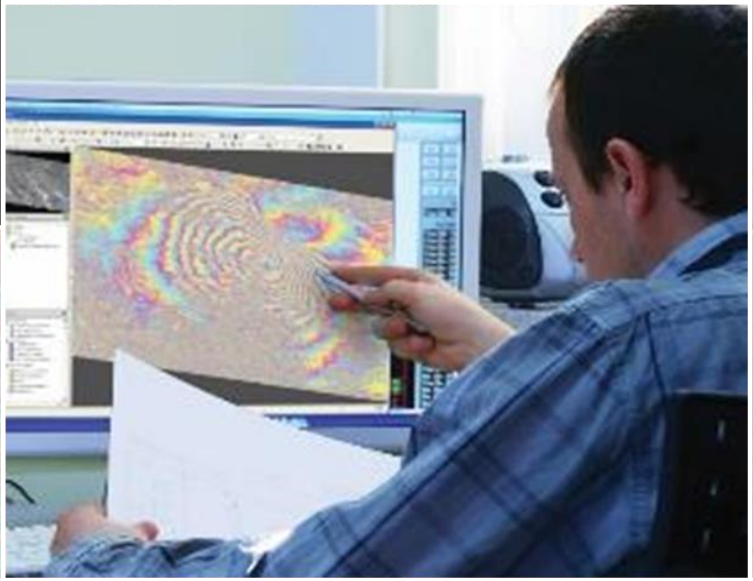












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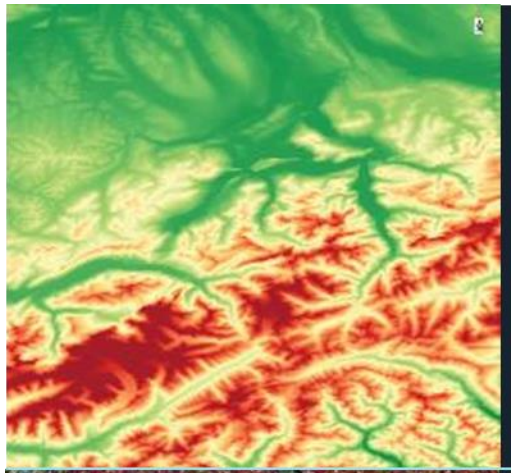
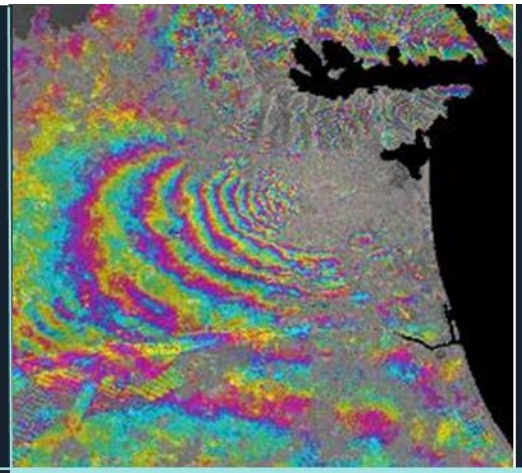
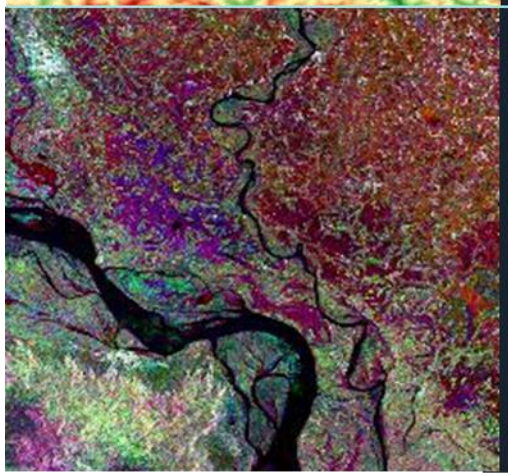
ENVI SARscape Analytics



Perform common SAR processing applications regardless of skill level



Easily process and analyze SAR data and generate products like DEMs or surface deformation maps

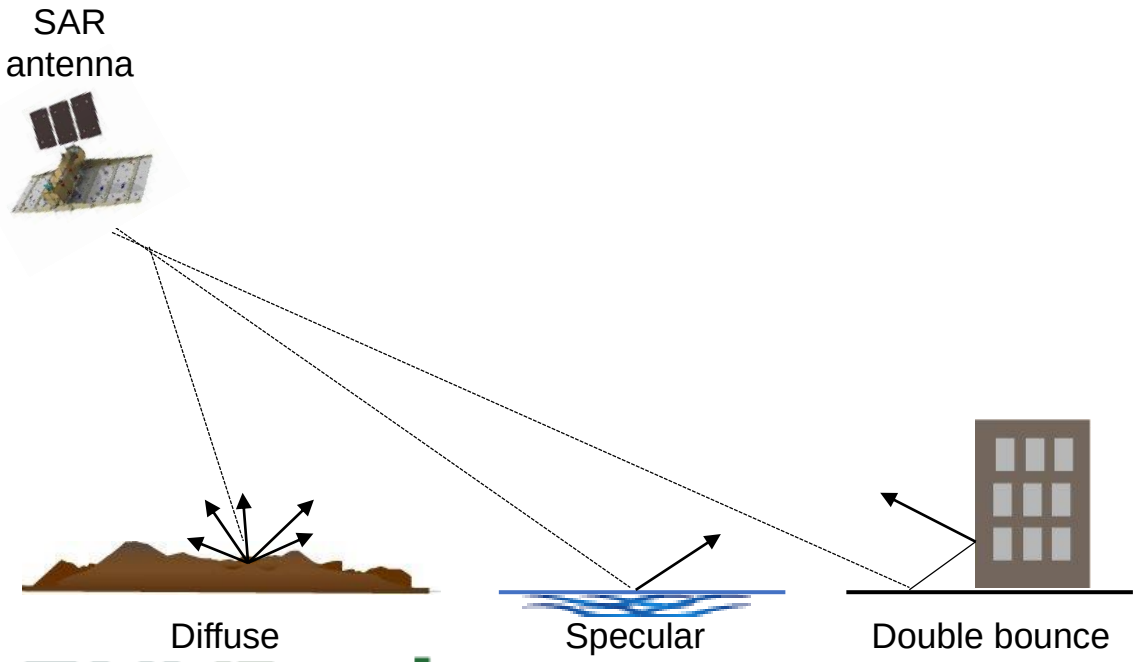


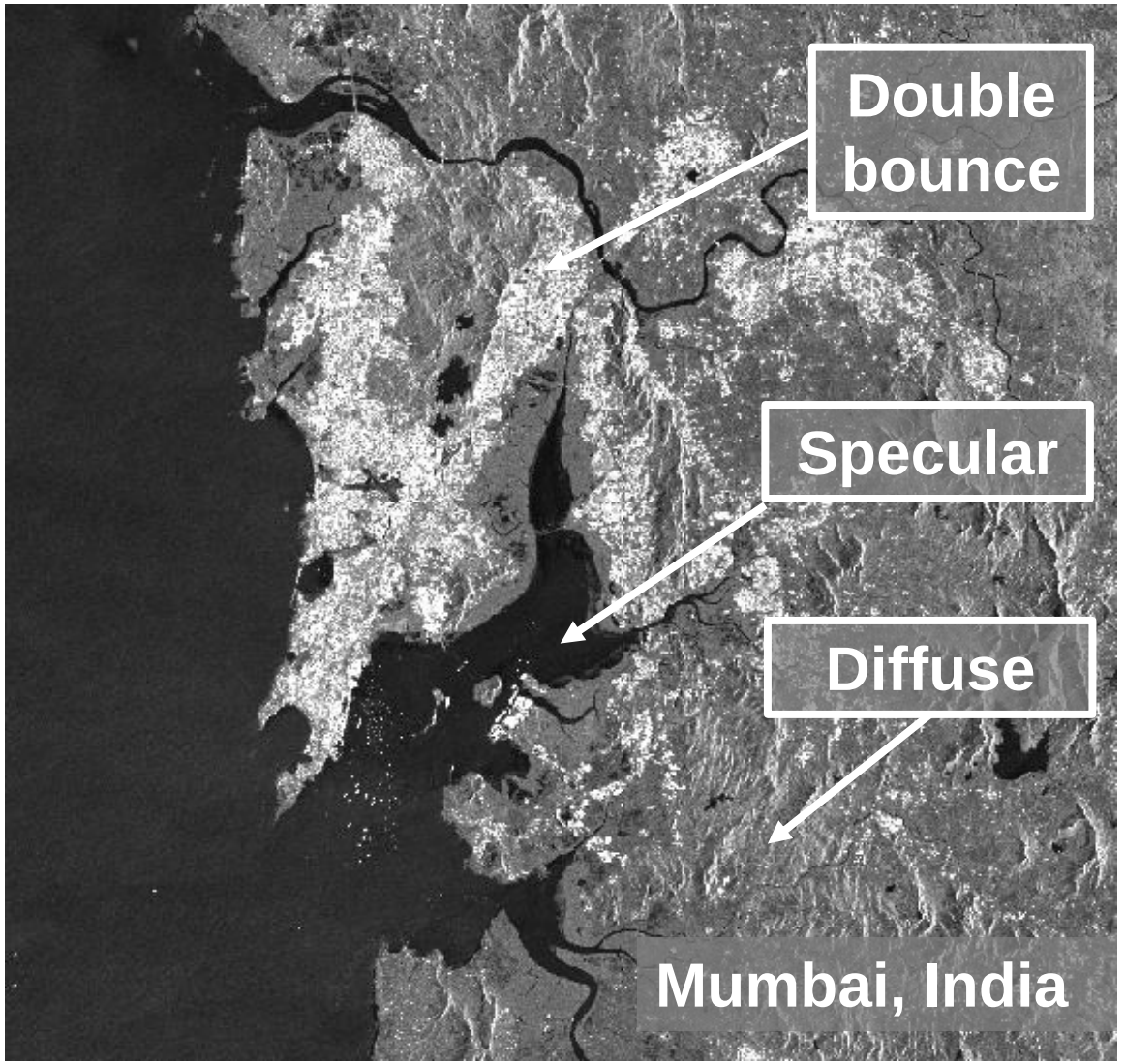
ENVI integration brings advanced image and SAR processing and analysis together in one package

- Flood mapping
- DEM extraction
- Sentinel download
- Sentinel auxiliary file download
- Time series
- Change detection
- Displacement map
- Ship detection
- Persistent scatterers
- Image geocoding

Ship Detection

Differences in radar backscatter highlight ships against water





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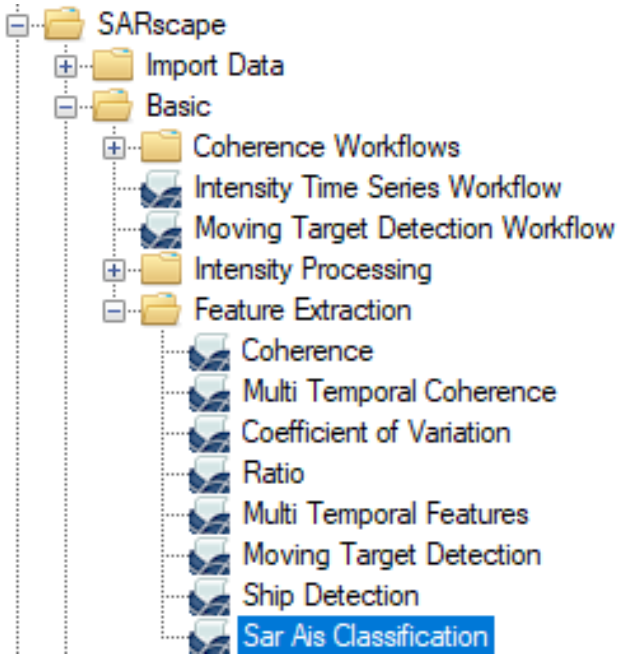
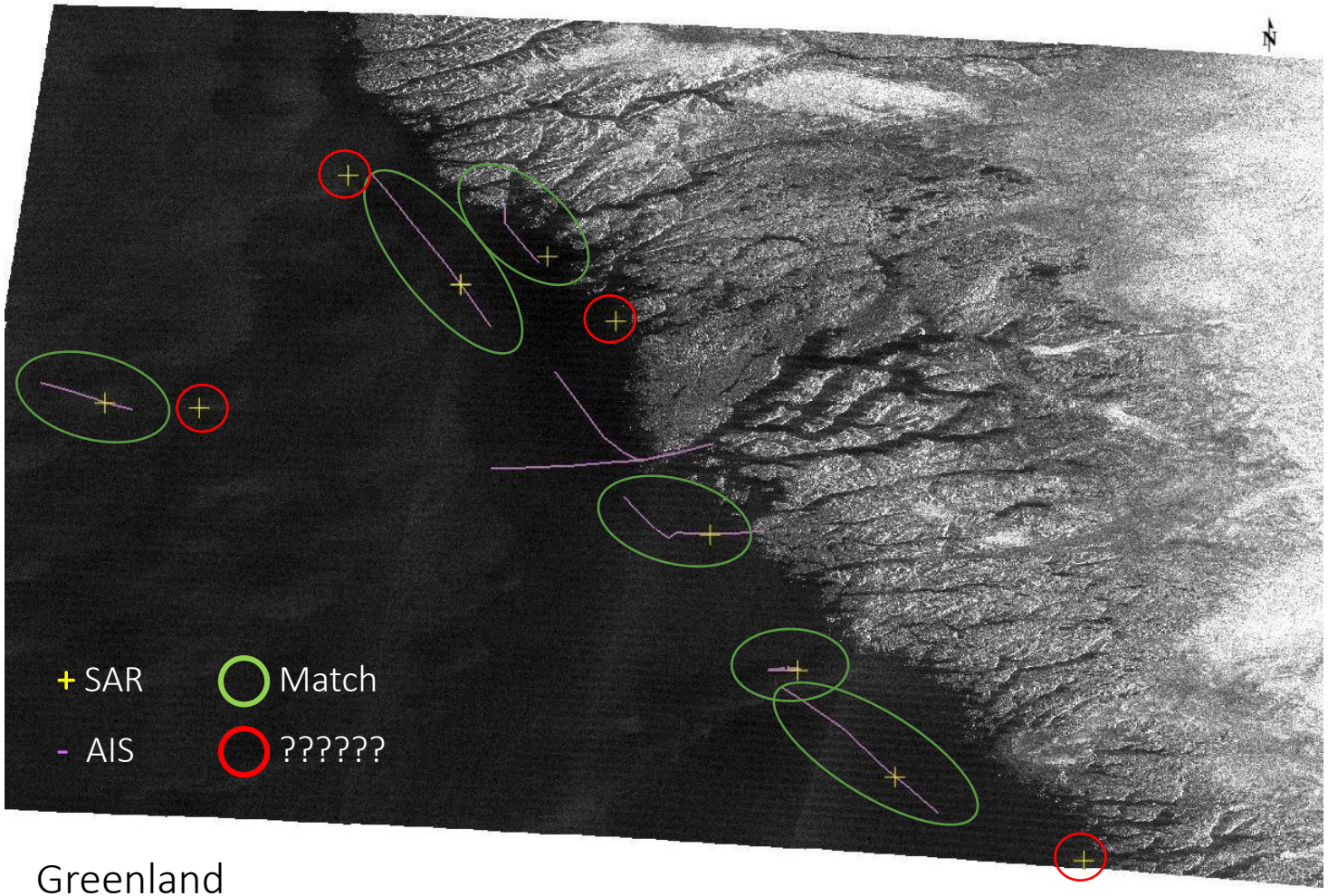
Ship Detection with AIS

AIS (Automatic Identification Systems) documentation for ships can be used with the ship detection tool





Greenland
Radarsat-2 data
SAR & AIS matching

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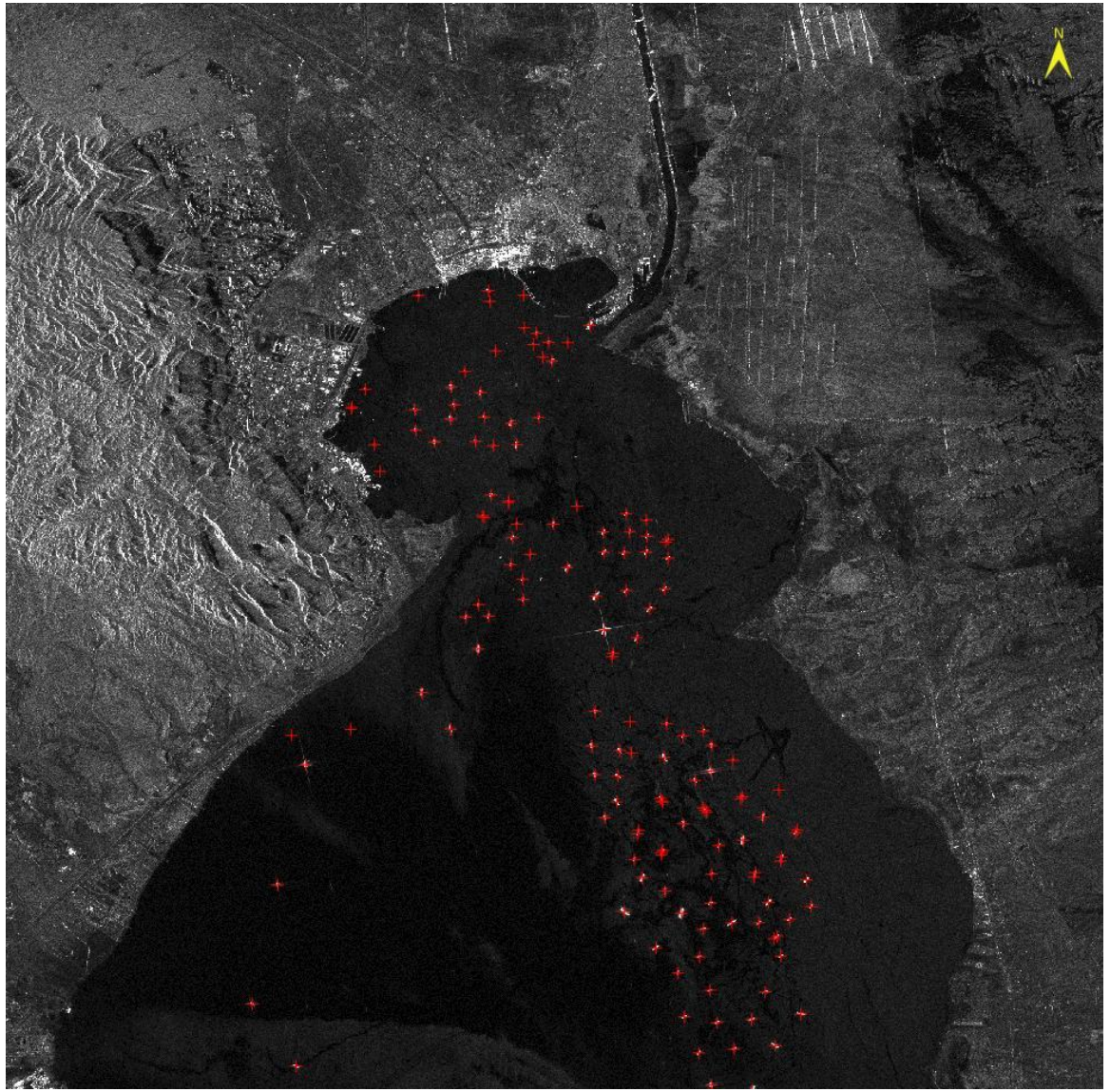
sarmap
your information gateway

The Ever Given Blockage



151 ships detected from Sentinel-1 data

25th March 2021

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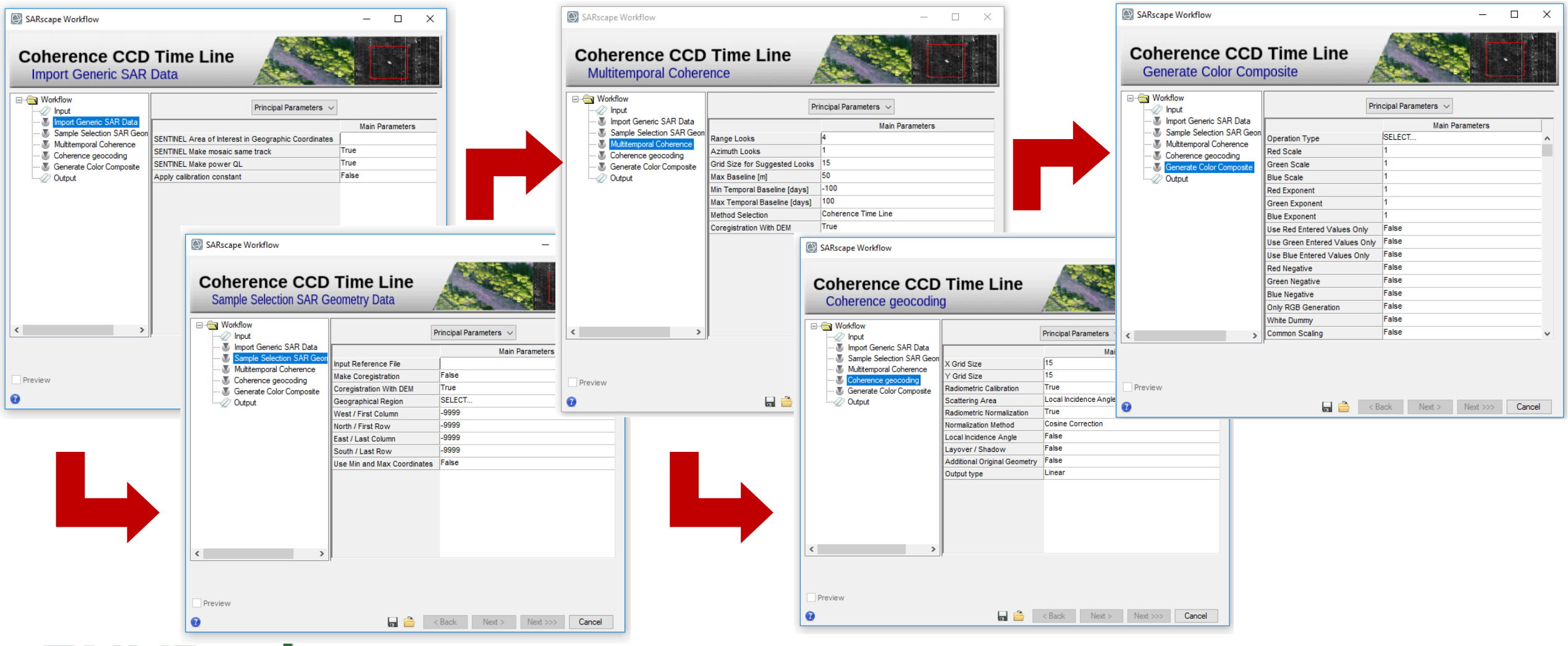
Coherence Change Detection



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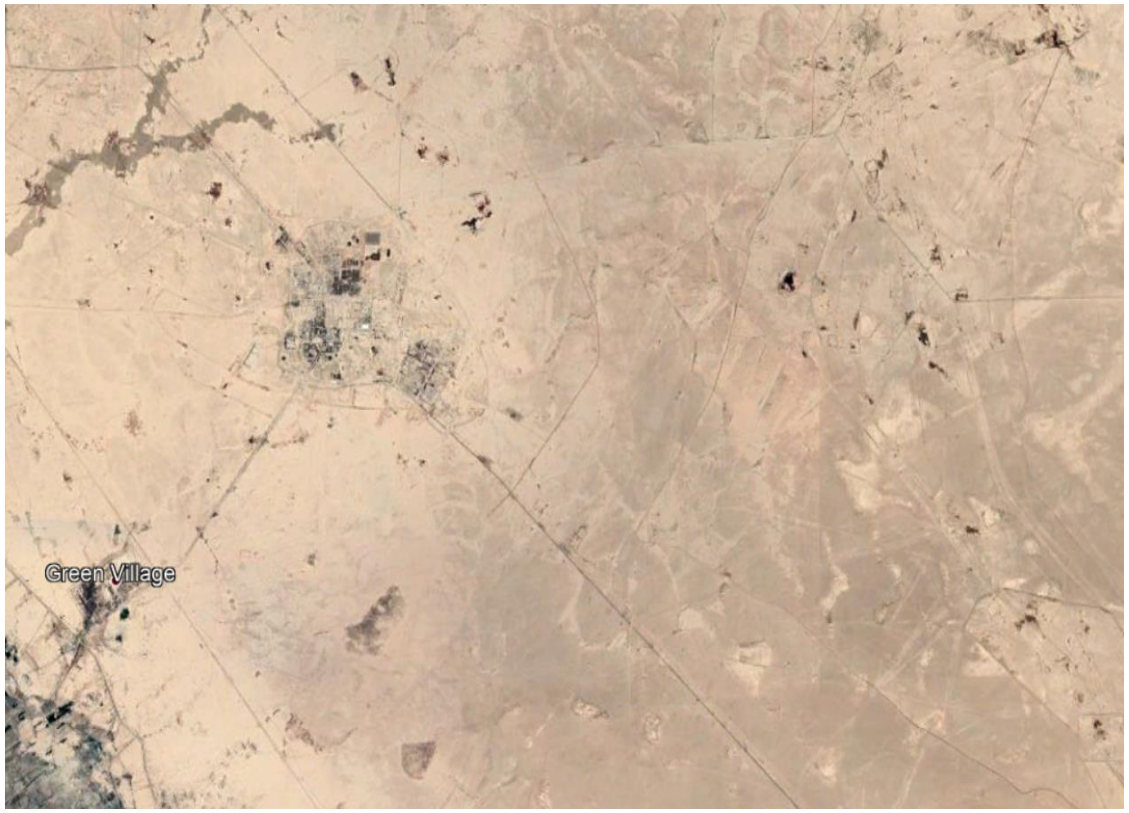
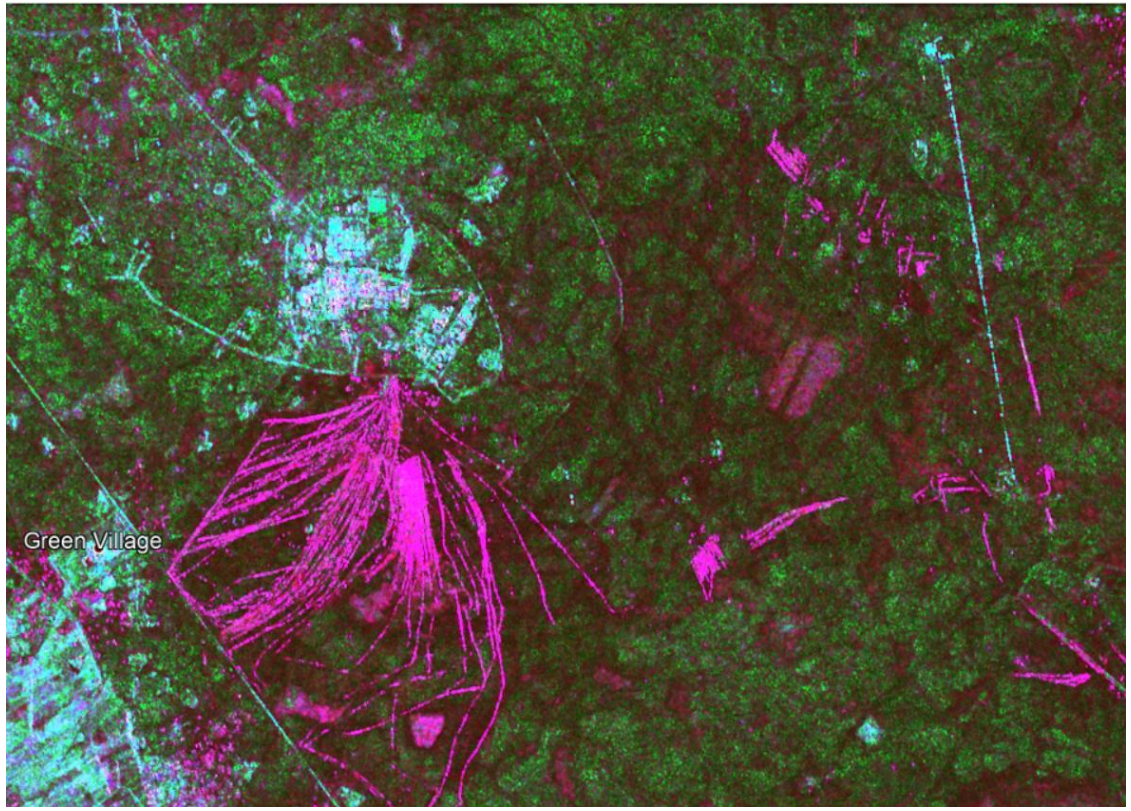
SAR Change Detection





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sarmap
your information gateway

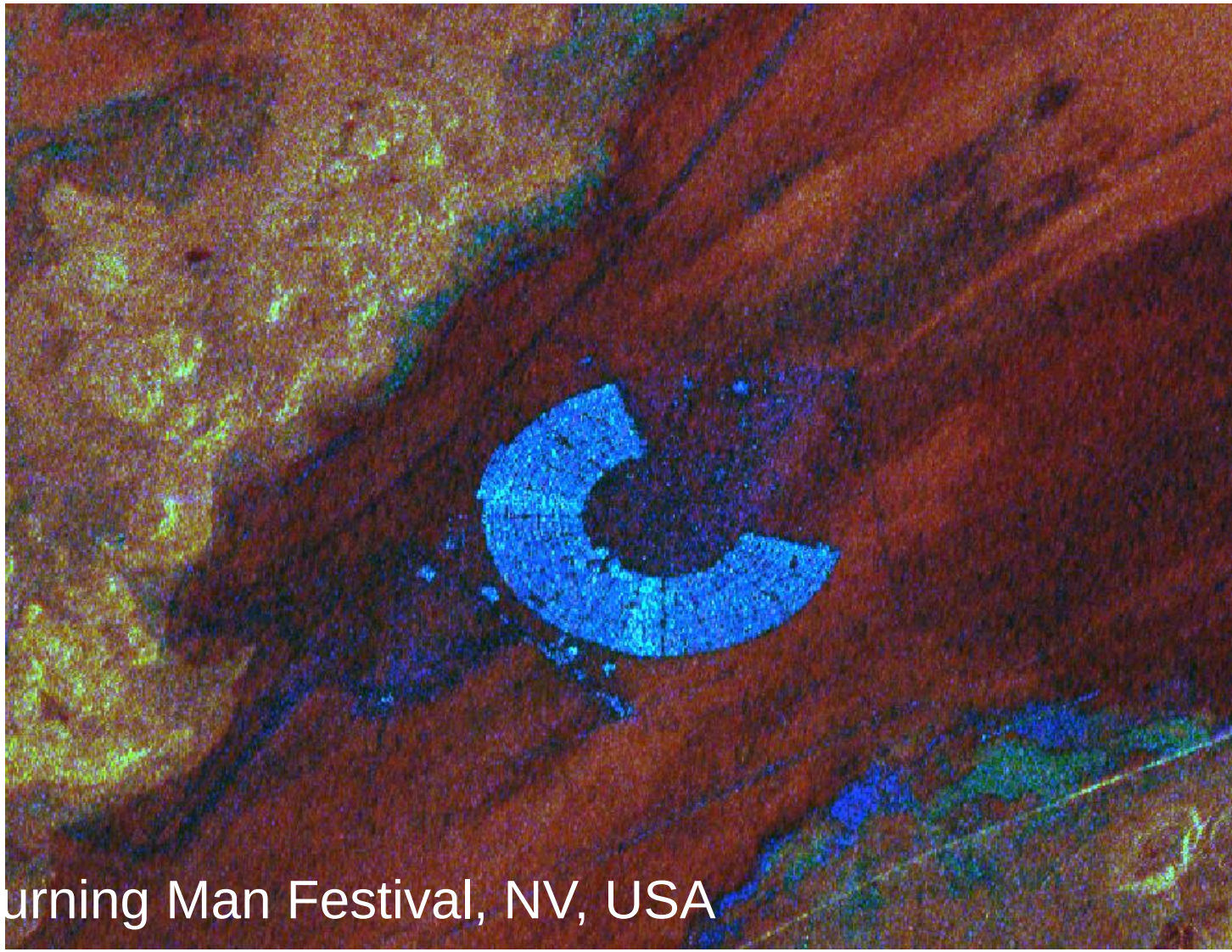
Activity Monitoring: Change Detection

Coherent change detection over
Burning Man Festival
Black Rock Desert, NV, USA

R: Coherence

G: Average backscatter

B: Difference in backscatter between pre (2018-06-08) and during (2018-08-31)



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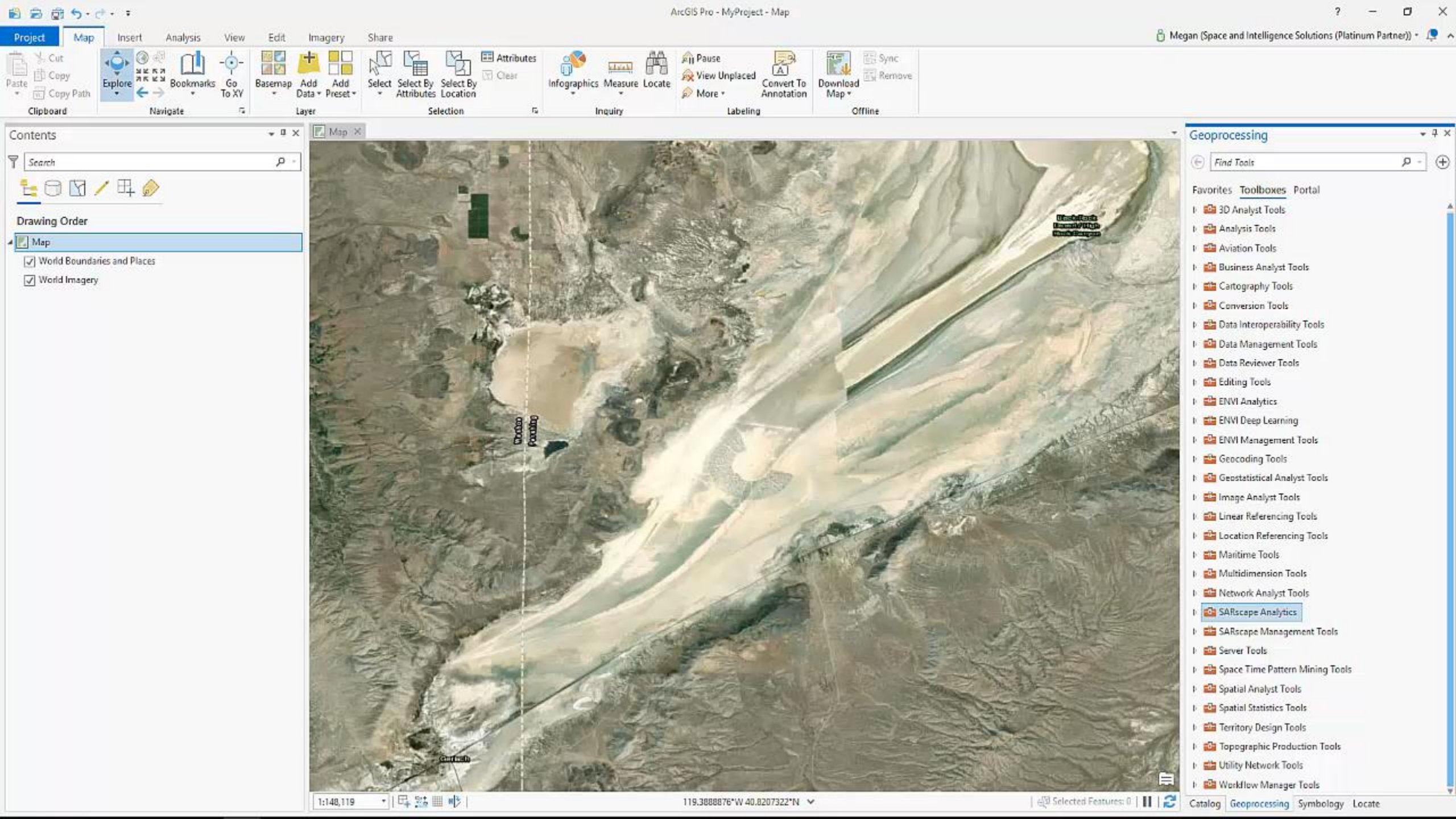
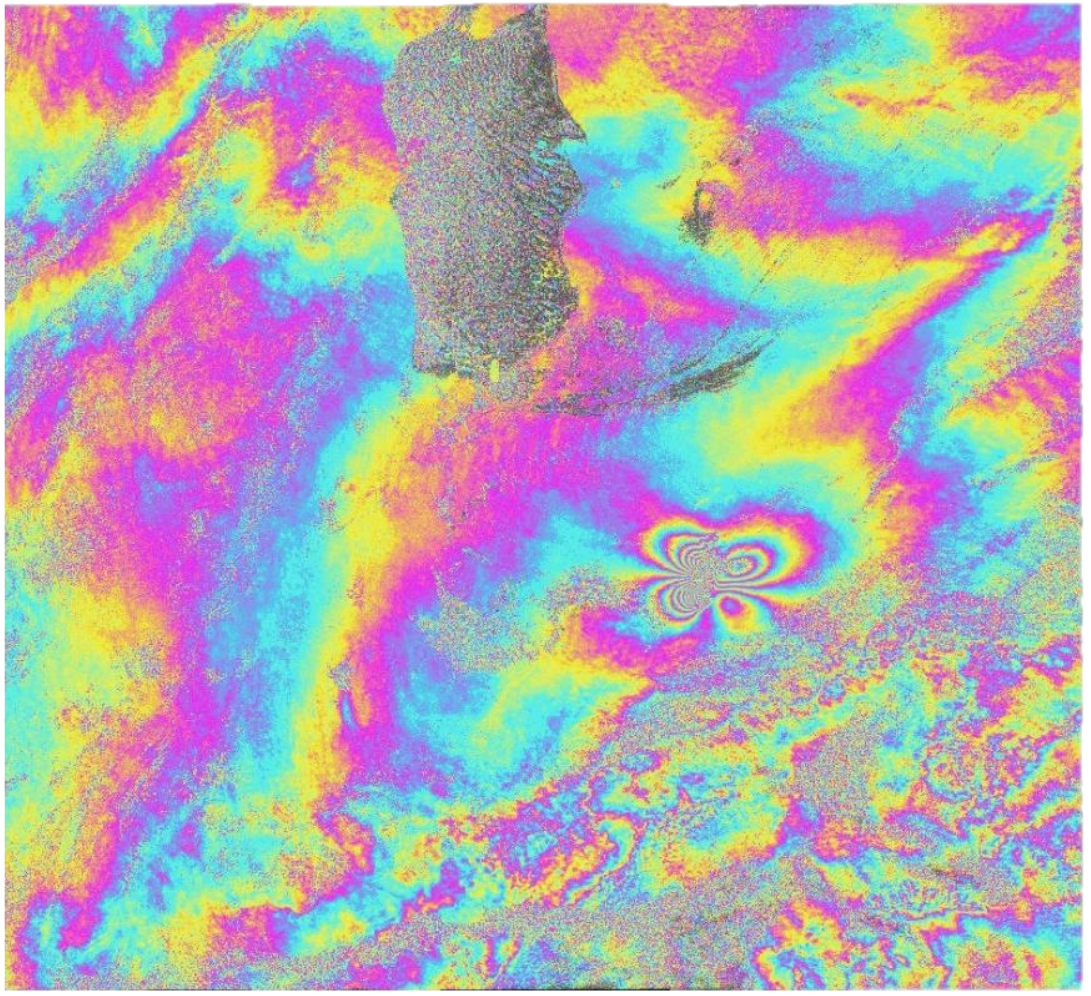

ArcGIS Pro - MyProject - Map
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Megan (Space and Intelligence Solutions (Platinum Partner))
Cut
Copy
Copy Path
Paste
Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Preset
Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Selection
Infographics
Measure
Locate
Inquiry
Pause
View Unplaced
More
Convert To Annotation
Labeling
Download Map
Sync
Remove
Offline
Contents
Search
Drawing Order
Map
World Boundaries and Places
World Imagery
Map
Geoprocessing
Find Tools
Favorites
Toolboxes
Portal
3D Analyst Tools
Analysis Tools
Aviation Tools
Business Analyst Tools
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Data Reviewer Tools
Editing Tools
ENVI Analytics
ENVI Deep Learning
ENVI Management Tools
Geocoding Tools
Geostatistical Analyst Tools
Image Analyst Tools
Linear Referencing Tools
Location Referencing Tools
Maritime Tools
Multidimension Tools
Network Analyst Tools
SARscape Analytics
SARscape Management Tools
Server Tools
Space Time Pattern Mining Tools
Spatial Analyst Tools
Spatial Statistics Tools
Territory Design Tools
Topographic Production Tools
Utility Network Tools
Workflow Manager Tools
1:148,119
119.3888876°W 40.8207322°N
Selected Features: 0
Catalog
Geoprocessing
Symbology
Locate

Using SAR to Track Movement

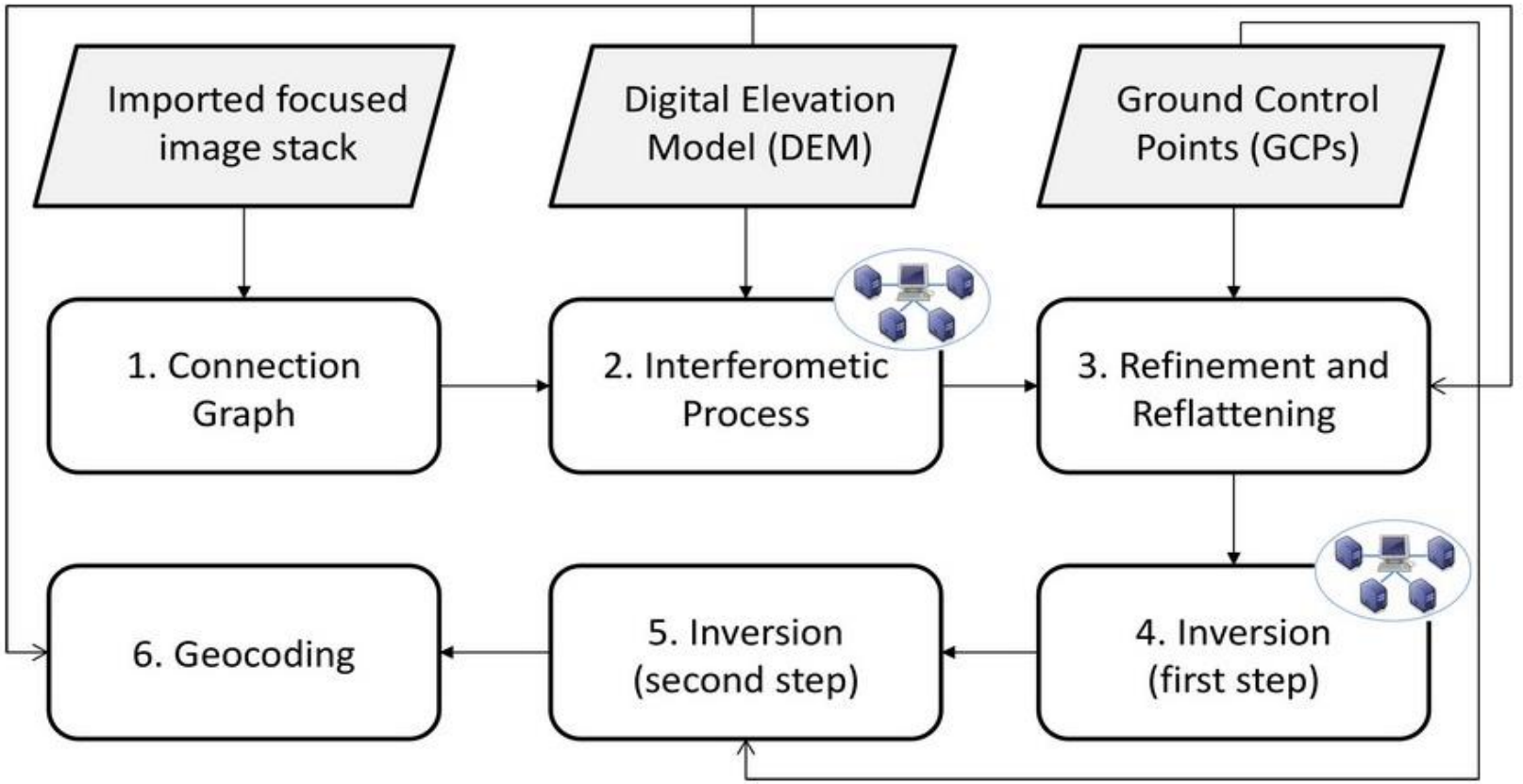
- Two methods can be used, Persistent Scatterers (PS) or Small BAseline Subsets (SBAS).
- PS can be used in cases that are showcasing linear behavior, in areas of urban or non-urban regions (such as outcrops) that have persistent reflectors.
- SBAS is used with non-linear behavior (can be modeled as quadratic or cubic) and can be used with lower coherence areas.

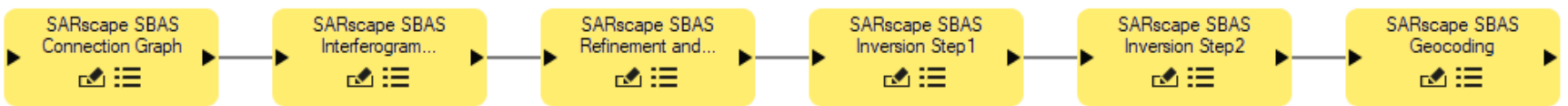


Highway 36 Collapse

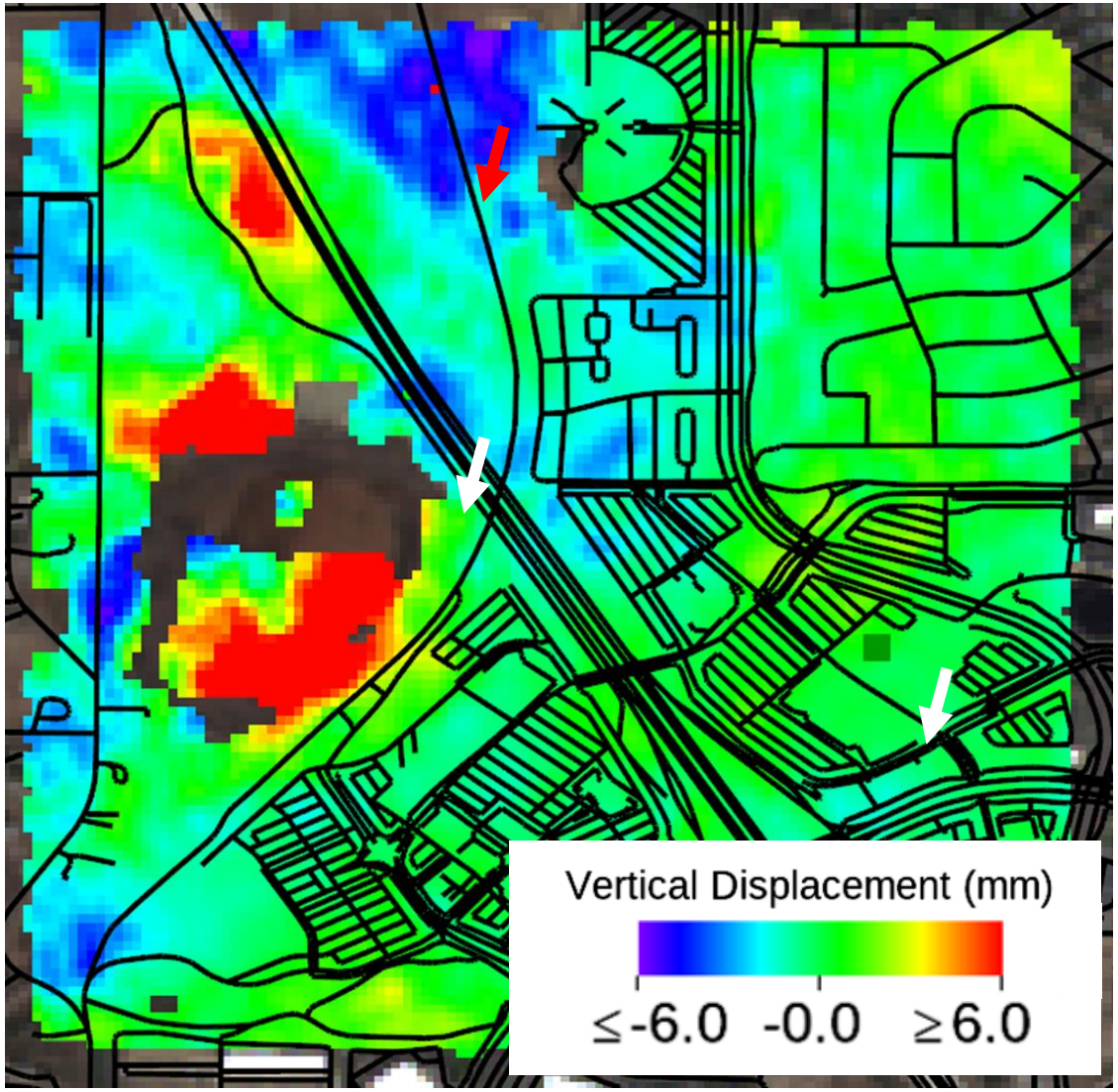
- July 12, 2019, a large crack began to spread across Eastbound lanes of Highway 36 near Church Ranch, Broomfield CO.

SBAS: Processing

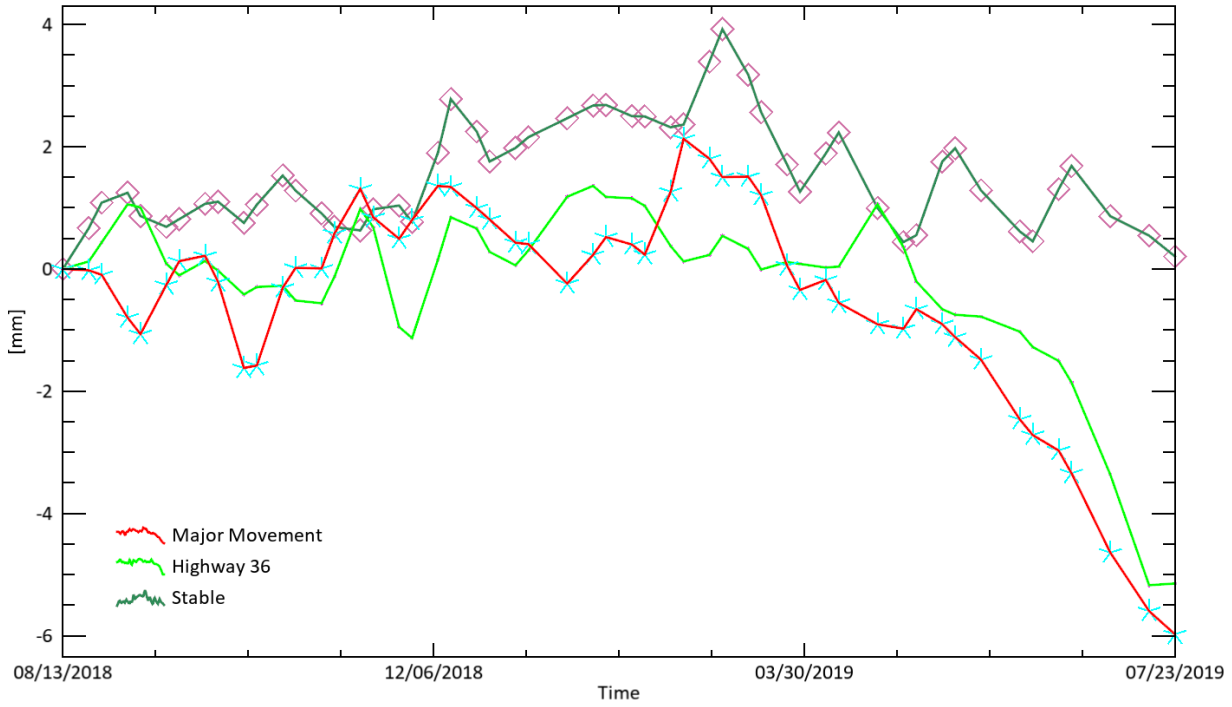




Vertical Movement



Vertical displacement over the region around the Highway 36 collapse.



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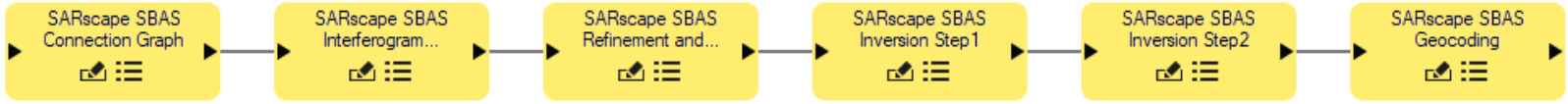
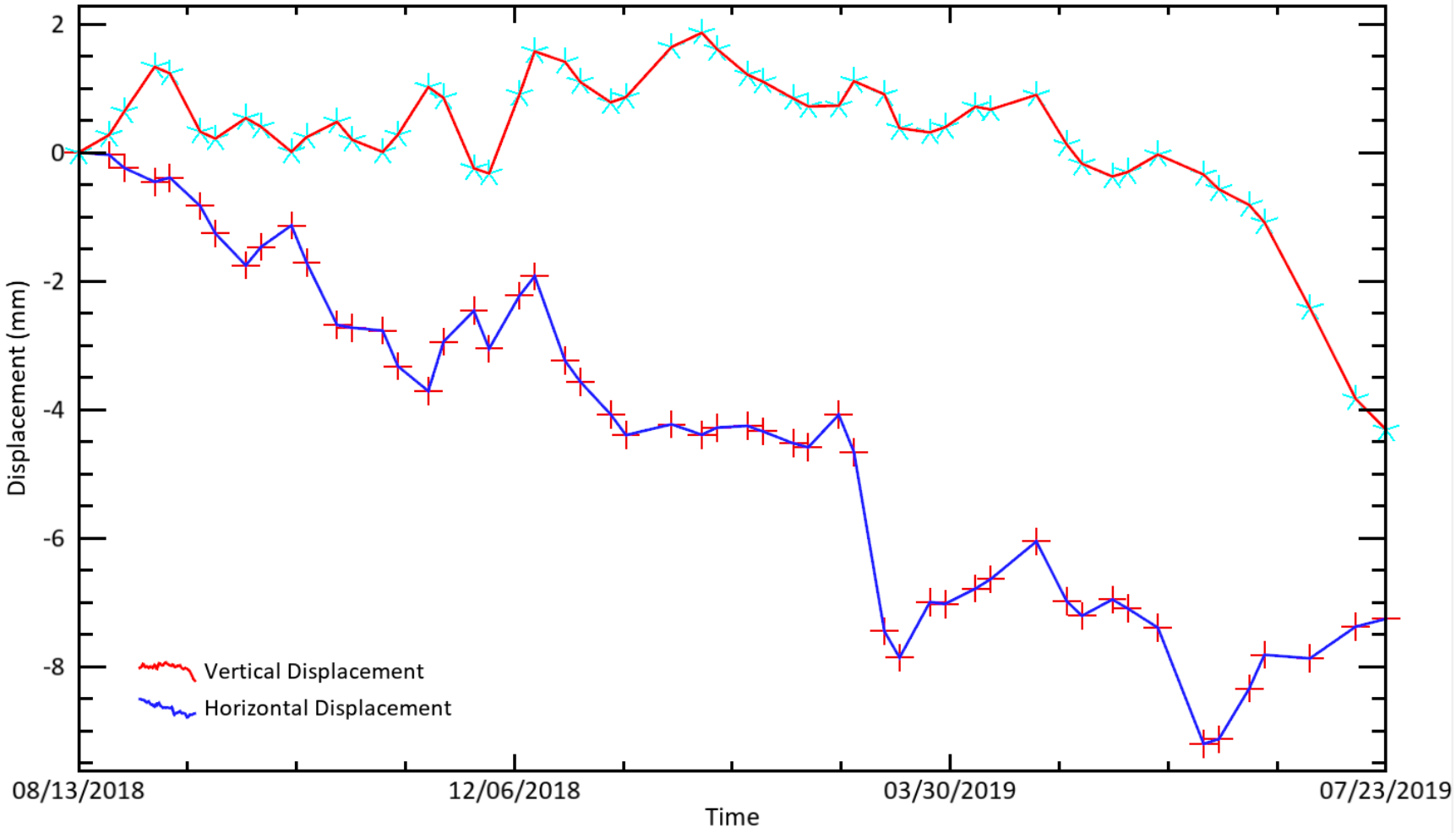


Vertical and Horizontal Movement

Horizontal vs vertical movement have very different stories.

Within the timeline, the area around the highway has been moving towards Church Hill Lake continually. As such we would need a much longer time period to see any major changes.

The vertical movement, however, has an obvious change that occurs around late May (which had over 4 inches of rain) and a sharp decline directly afterwards.



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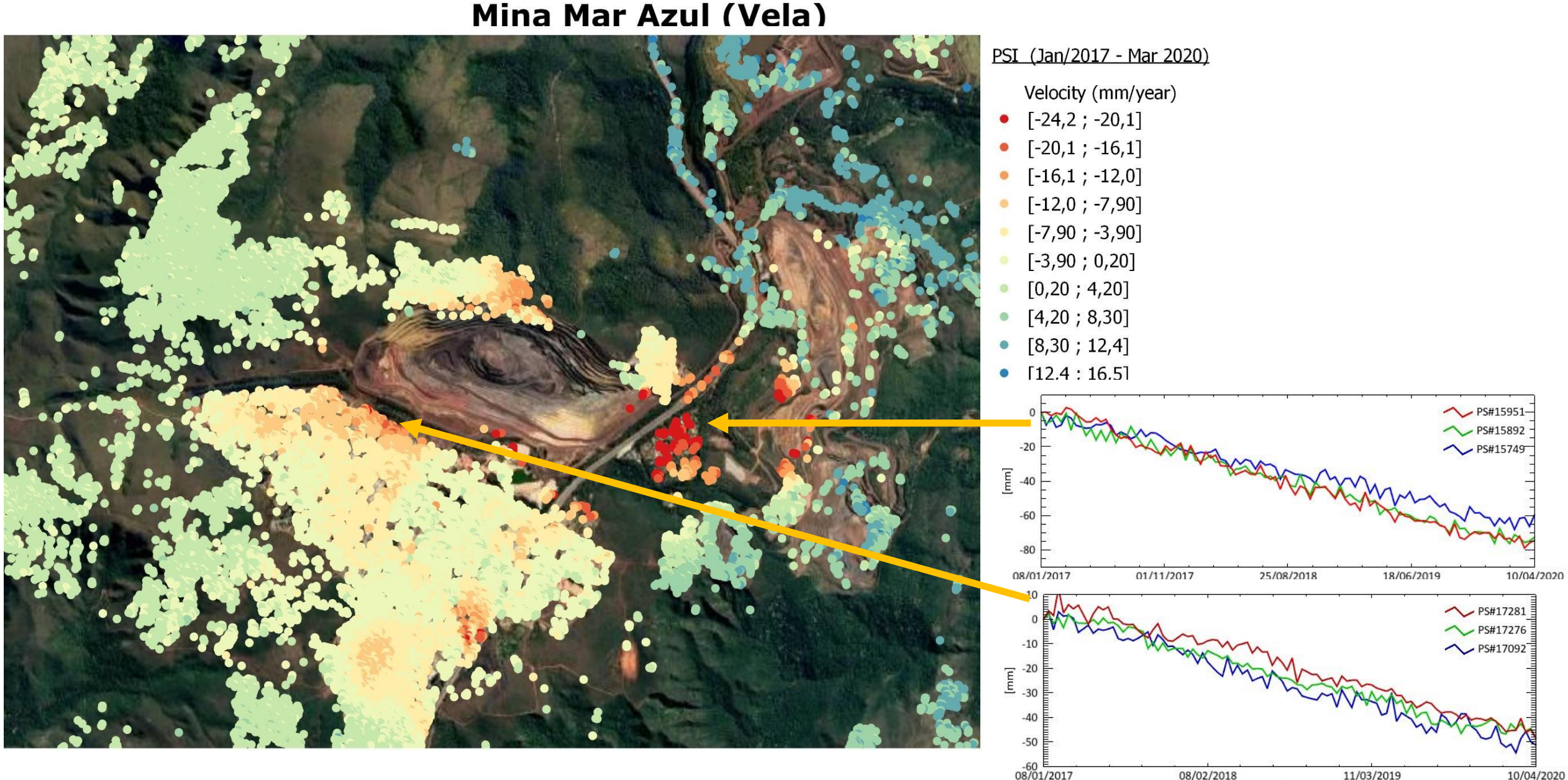
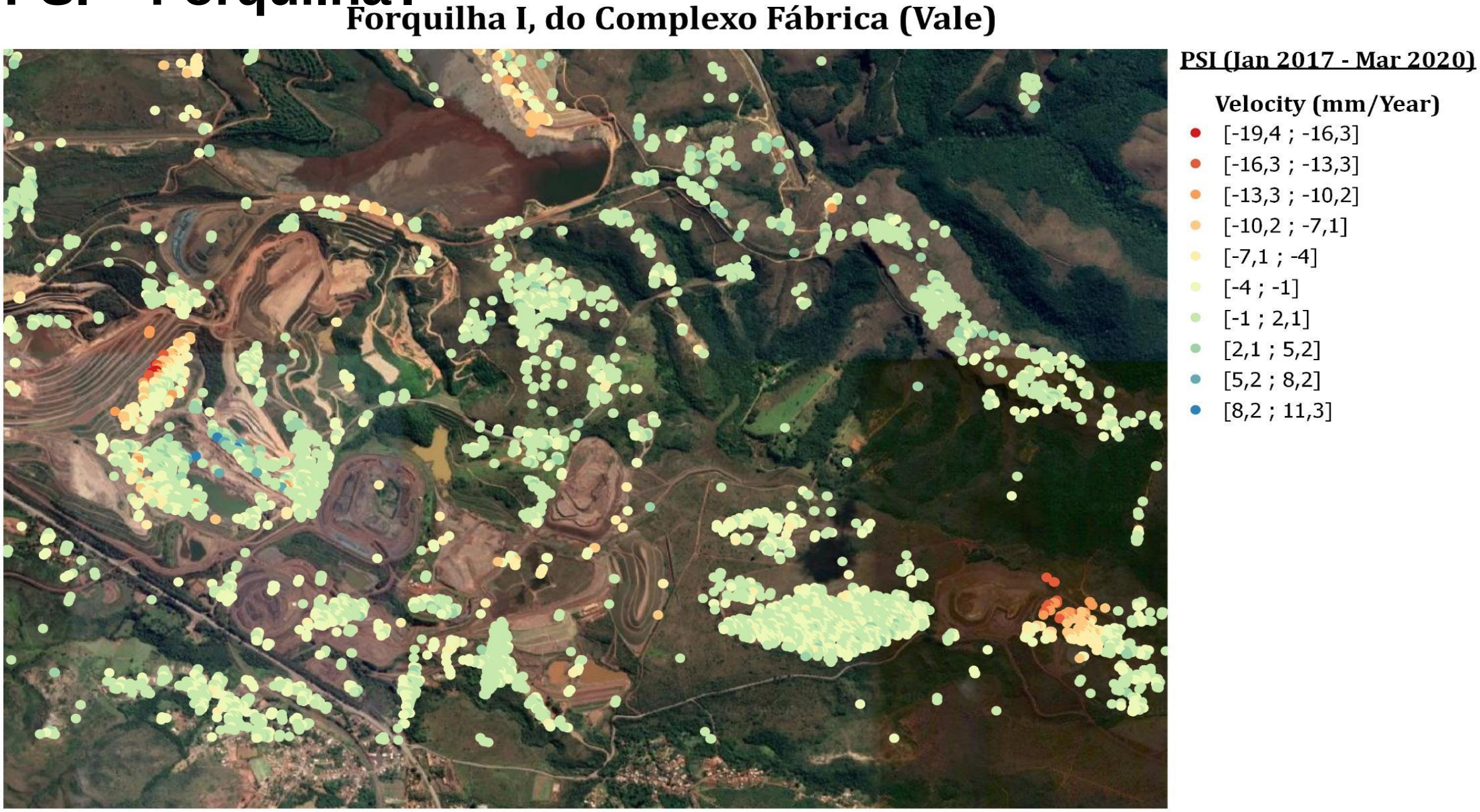
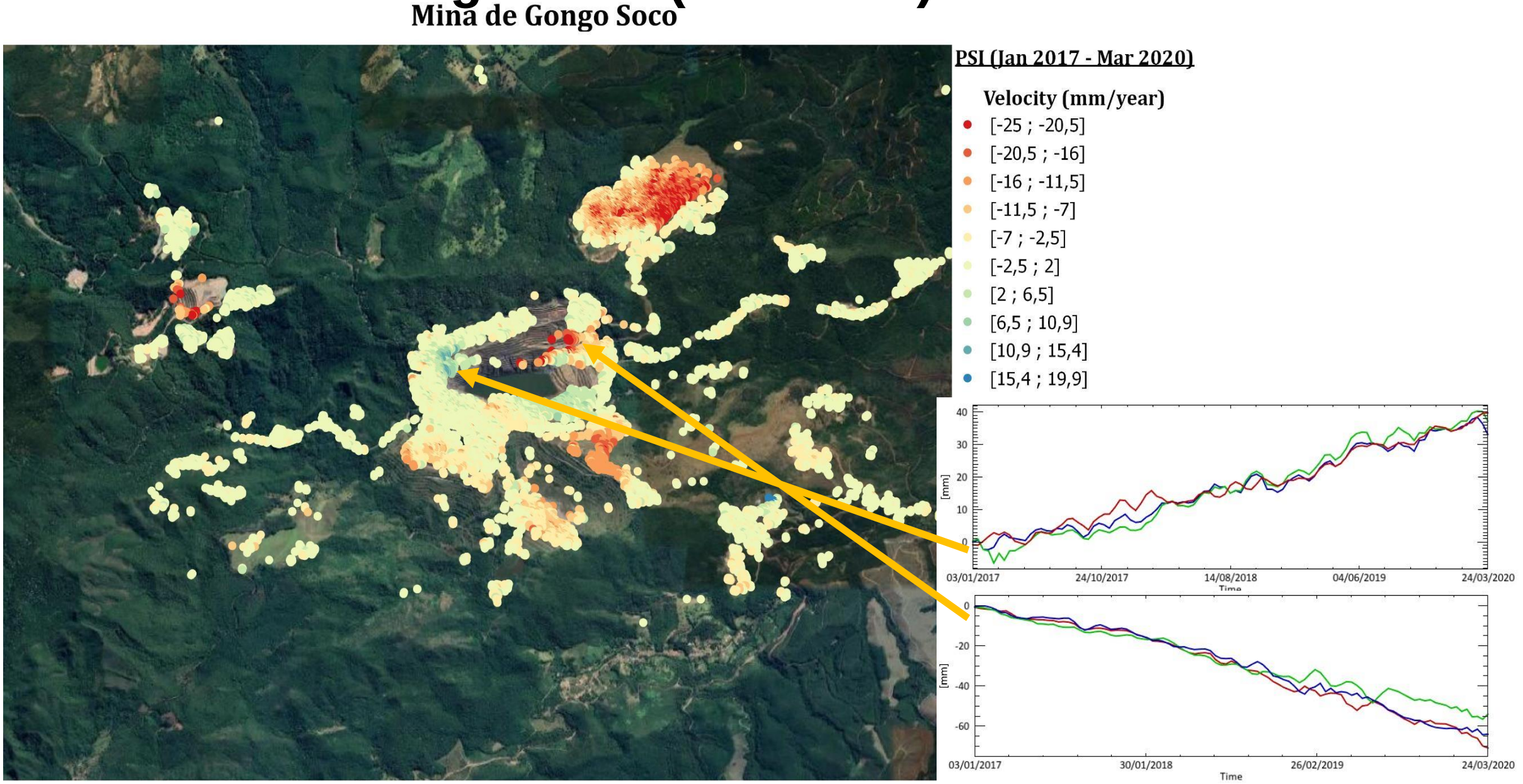
PSI - Mina Mar Azul (Vale)



PSI – Forquilha I



PSI – Mina de Gongo Soco (overview)



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303-786-9900

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